SD
11
.R1

INTERMOUNTAIN STATION
Central Reference File
No. 9:42 lah

USING HELICOPTER TO CHEMICALLY CONTROL BIG SAGEBRUSH AND WYETHIA ON THE BEAVERHEAD NATIONAL FOREST, 1959

U.S. Department of Agriculture
Forest Service - Region 1
Missoula, Montana

Report by: D. W. Nelson and V. N. Stokes
Date: January 26, 1960

LIBRARY FILE COPY

USING HELICOPTER TO CHEMICALLY CONTROL BIG SAGEBRUSH AND WYETHIA ON THE BEAVERHEAD NATIONAL FOREST, 1959

I. SUMMARY APPRAISAL

Flight-height restrictions have forced Region 1 to discontinue use of fixed-wing aircraft for control of undesirable range plants. Helicopter use was initiated as an alternative.

A helicopter project of this size was new to the region. Total national forest area treated was 10,770 acres. Very limited information was available on crew organization, equipment rental, how and where to locate helispots, and other factors influencing the feasibility of such a project. On this project, enough records were kept so analysis of costs was possible. Such data will be useful in planning future projects.

Accomplishments were greater than anticipated. Performance of the G-2 Bell helicopter was greater than expected - 20 to 40 gallons of spray material per trip were hauled and sprayed on areas ranging in elevation from 6,400 to 8,500 feet. Spray material was applied uniformly and in the safest manner known.

Per acre helicopter costs competed closely with previous costs for fixed-wing. Spray flying was bid at $105 per hour. Flying time for hauling personnel was at the regional fire contract rate of $90 per hour. Flying costs averaged $1.06 per acre, including all ferry time to haul flaggers and others to spray areas. Total costs including some protection fencing averaged $5.01 per acre.

Sample card checks showed a high rate of material reaching the ground vegetation. Three study plots were established, using different intensities of acids and application rates to see if less material would give satisfactory results. The writers believe that 2 gallons of spray solution containing 2 pounds of 2,4-D acid equivalent will give good coverage and secure satisfactory results. If the studies show this to be true, flying costs can be reduced by an estimated one-fourth.

The project was completed with dispatch. Close cooperation existed between the contract fliers and the ground-crew organization. The Johnson Flying Service is commended for their excellent service and the Beaverhead National Forest for the manner in which the project was organized, supervised, and carried to successful completion. Future projects of this type should be favorably considered by the region.

II. GENERAL

The helicopter spraying was done on the Beaverhead National Forest between June 15 and July 12, 1959. Areas treated are located on the south end of the Gravelly range and on the Pioneer range in the

Big Hole. The Gravelly range topography is broken by many small drainages with moderately steep slopes and rounded ridgetops. The Big Hole area is less broken and has more gentle slopes. Elevations of spray areas range from 6,400 feet to 8,500 feet. Annual precipitation varies from 12 inches in the Big Hole to 20 inches on the Gravelly range. Soil is sandy loam in the Big Hole and clay loam in the Gravellies. This spraying was done on ranges allotted to both sheep and cattle. Heavy stands of big sagebrush (Artemesia tridentata) and mules-ears wyethia (Wyethia amplexicaulis) were treated. Sagebrush areas had a fair to good understory of desirable range grasses. Most wyethia areas had sparse cover of desirable range plants.

Some big game and sage grouse use occurs primarily during the summer on the areas treated. The control of sagebrush and wyethia was considered unimportant to the welfare of wildlife in this area.

Most of the treated area will be given protection for 1 or 2 years, although some parts will be deferred only and then used lightly for 2 years.

The total area treated on the national forest was 10,770 acres. Projects were: the West Fork, 6,400 acres, and Landon, 2,410 acres - Madison Ranger District; Doolittle, 970 acres - Wisdom Ranger District; and Bull Creek, 990 acres - Jackson Ranger District. In addition, 320 acres were sprayed for the Bureau of Land Management under cooperative deposit agreement.

A G-2 Bell helicopter was used. It was equipped with two connecting tanks with total capacity of 120 gallons. The spray boom was 29 feet 2 inches long and made of ½-inch aircraft tubing. Nineteen number 2 spray system incorporate nozzles were used with orifices of 3/32 inch. These were pointed 90 degrees downward. The spray pressure maintained was 45 to 47 pounds. Flying speed was 45 miles per hour and flight height from 15 to 25 feet. Effective spray width was 50 feet.

Three 70-acre test plots were sprayed, using the following 2,4-D acid intensities and fuel-oil carrier:

Test plot 1 - 1 pound acid equivalent in 2 gallons of oil.
Test plot 2 - 1-1/3 pounds of acid equivalent in 2 gallons of oil.
Test plot 3 - 2 pounds of acid equivalent in 2 gallons of oil.

A strip 100 feet wide was left unsprayed between each plot so effects of drift would be eliminated.

Four 3-step clusters were established in representative areas of sagebrush and wyethia on the West Fork and Landon projects. Clusters were also established on representative sagebrush areas on the Doolittle and Bull Creek spray projects.

The spraying on the Bull Creek C&H allotment of Jackson District was done as a part of a planned demonstration allotment. This allotment, in conjunction with the spraying, was divided into five fenced pastures which can be deferred and rotated under a detailed system of management.

Safety was given full consideration on all phases of the project. The job was completed without a mishap. One of the key safety factors to a safe project is to have adequate windsock or flag at each helispot. Landing a helicopter with a tailwind can be disastrous. Copy of safety plan is included in the Appendix.

III. ORGANIZATION

The manpower used was greater than is considered necessary for future projects. Essential manpower was hired to secure desired costs and time records for use in planning future projects. Helicopter contracting was on an hourly basis, since the region and prospective contractors lacked information on what the per-acre flying costs might be. Contracting by the hour required keeping additional time records. Five flaggers were used on flight lines of 1 mile or more in length. Three flaggers were adequate for flight lines up to 1 mile. The contractor furnished two pilots and one mechanic, plus transportation for these personnel, and for gasoline to the helispots. The pilots alternated so each had 1 hour's flying time and 1 hour's rest. Due to the strenuous nature of the flying, the use of two pilots was considered a good safety precaution.

Suitable flying time each day and period for treating wyethia is generally limited. Our desire was to spray as many acres as possible and at the proper time. In order to do this, the helicopter was applying spray mix to the maximum flying time each day and moved to different areas as wyethia plant development reached the early blooming stage. Temperature was usually the limiting factor on length of flying for each day.

Manpower organization chart is shown as Appendix B.

Motorized equipment used was as follows:

1 power wagon, 1-ton, International, with 500-gallon tank (maximum load hauled 400 gallons).
1 jeep, 1-ton, 4-wheel drive, with 300-gallon tank (200 gallon maximum load hauled).
1 tanker, semi-, 4,000-gallon. Used as mother tank.
2 pickups, ½-ton, 4-speed.
2 pickups, ½-ton, 4-wheel-drive.
1 pickup, 3/4-ton, 4-speed.
1 helicopter, Bell G-2.

Spray mix was hauled to the mother storage tanker by two oil companies holding Government fuel oil contracts. These companies mixed the 2,4-D chemical with the fuel oil with no additional cost for this service. Close supervision and assistance were given by forest officers.

The major difficulty and chief concern experienced was making certain an adequate supply of spray mix would be available for immediate loading at the particular helispot from which the helicopter desired to operate.

Our 4-wheel-drive tanker trucks required 2 hours, on the average, to make a round trip from the mother storage tanker to the helispots, although it varied from 1 hour to as long as 3 hours. Therefore, unless these tanker trucks were emptied immediately upon arrival at the helispot, we would fail to keep a supply of spray mix moving from the mother storage tanker to the helispots.

The lack of suitable roads for hauling spray mix to helispots was a problem. When motorized equipment bogged down in the mud, two strings of pack mules were moved in to haul spray mix to the helispots. Some spray mix was hauled with these mules, but they did not prove to be the answer to the problem.

Storage at the helispots was provided by using both extra 10-gallon milk cans and 55-gallon drums. When a tank load of spray mix arrived at the helispot, all empty milk cans were filled by gravity flow. Any mix remaining was put into 55-gallon drums. We attempted to avoid the use of 55-gallon drums since mix stored in them had to be pumped out by hand into the milk cans for dumping into the helicopter. However, in order to have plenty of mix ahead at the helispots, we found it necessary to use these 55-gallon drums.

There are several possible ways to overcome this problem of supply:

1. Provide additional 4-wheel-drive tanker trucks with pumper attachment to have ample spray mix storage at the helispots and also have ample spray mix hauling capacity.

2. Provide larger capacity 4-wheel-drive pumper tanker trucks.

3. Provide an adequate combination of 1 and 2 above.

4. Provide suitable trailer-type power tankers so as to have the mix at helispots well in advance of need.

These trailer tankers can be moved with crawler-type tractors to helispot locations in difficult situations.

The proper location of helispots in relation to the area to be sprayed is a key factor to a successful operation. Helispots need to be so located that empty ferry time back for reloading is held to a minimum. Our experience pointed toward having helispots located not more than 1

mile apart. On 1 day we had spray mix available at two adjacent helispots approximately 1¼ miles apart. When the helicopter needed a new load of mix the pilot would return to the nearest helispot. A certain amount of empty ferry time was saved, but in order to make such a plan work, it is necessary to have loaders available at both helispots along with the necessary storage of spray mix. The increased loading cost may or may not result in a savings in helicopter hire. At the rate of $1.75 per minute for helicopter hire, it is important to devise the best possible use of every second.

IV. SUMMARY ANALYSIS OF COST AND ACCOMPLISHMENT

Value of chemical on hand (fiscal year 1957)	$9,331.05
1959 fiscal year budget and expenditure	33,894.84
1960 fiscal year expenditure	14,436.13
Total available	$57,662.02
Less:	
Expenditure Metzel Creek fixed-wing flight-height study	2,760.76
Value of chemical on hand	965.00
	3,725.76
Total expenditure on helicopter project	$53,936.26

National forest acreage treated by projects:

West Fork	6,400 acres
Landon	2,410 acres
Doolittle	970 acres
Bull Creek	990 acres
	10,770 acres

Average cost per acre, including fencing, $5.01.

V. DETAILED ANALYSIS OF COSTS FOR 10,770 ACRES

Items	Amount	Cost per acre
Wages	$11,729.34	$1.09
Per diem	965.70	.09
Transportation	3,588.94	.33
Camp expense other than wages	535.24	.05
Fuel oil and chemical mixing	5,178.57	.48
Telephone calls	51.97	.005
*Flying: Spraying	10,560.75	.98
Ferrying personnel	860.73	.08
Chemicals	16,322.25	1.52
Other miscellaneous	1,764.02	.165
Recondition tanker truck	250.00	.02
Dozer hauling and operator wages	403.00	.04
Bull Creek fencing	1,725.75	.16
	$53,936.26	$5.01

* BLM flight time excluded.

VI. SUMMARY OF DAILY ACCOMPLISHMENT

1959	Number loads		Gallons sprayed		Acreage sprayed		Flight time				Accumulated total
							Spraying		Ferrying		
	Today	To date	Today	To date	Today	To date	Today	To date	Today	To date	
6-15	16	16	440	440	*120	120	1:48	1:48	0:36	0:36	2:24
6-16	36	52	1,015	1,455	**360	480	4:03	5:51	-	0:36	6:27
6-17	45	97	1,270	2,725	580	1,060	4:07	9:58	0:30	1:06	11:04
6-18	54	151	1,540	4,265	590	1,650	5:34	15:32	0:06	1:12	16:44
6-19	63	214	1,830	6,095	660	2,310	6:02	21:34	0:09	1:21	22:55
6-20	53	267	1,410	7,505	590	2,900	5:02	26:36	0:17	1:38	28:14
6-21	-	-	(Rained all day)		-	-	-	-	-	-	-
6-22	23	290	660	8,165	260	3,160	2:20	28.56	0:20	1:58	30:54
6-23	43	333	1,230	9,395	440	3,600	3:41	32:37	0:21	2:19	34:56
6-24	64	397	1,830	11,225	640	4,240	5:16	37:53	0:45	3:04	40:57
6-25	75	472	2,130	13,355	720	4,960	7:35	45:28	0:36	3:40	49:08
6-26	-	-	(Rained all day)		-	-	-	-	-	-	-
6-27	101	573	3,000	16,355	1,060	6,020	8:27	53:55	0:07	3:47	57:42
6-28	33	606	930	17,285	355	6,375	3:06	57:01	0:04	3:51	60:52
6-29	44	650	1,280	18,565	440	6,815	4:34	61:35	0:38	4:29	66:04
6-30	22	672	660	19,225	240	7,055	2:17	63:52	0:12	4:41	68:33
7-1	55	727	1,530	20,755	520	7,575	5:10	69:02	0:37	5:18	74:20
7-2	42	769	1,320	22,075	450	8,025	4:51	73:53	0:04	5:22	79:15
7-3	3	772	50	22,125	17	8,042	0:17	74:10	0:17	5:39	79:49
7-4	44	816	1,185	23,310	405	8,447	4:24	78.34	-	5:39	84:13
7-5	48	864	1,295	24,605	440	8,887	4:43	83:17	0:10	5:49	89:06
7-6	21	885	630	25,235	240	9,127	2:43	86:00	-	5:49	91:49
7-7	-	-	(Moved from West Fork to Wisdom)				-	-	-	-	-
7-8	62	947	1,840	27,075	614	9,741	6:15	92:15	2:33	8:22	100:37
7-9	35	982	1,075	28,150	359	10,100	3:58	96:13	-	8:22	104:35
7-10	39	1,021	1,140	29,290	380	10,480	3:47	100:00	1:17	9:39	109:39
7-11	36	1,057	1,080	30,370	360	10,840	3:38	103:38	0:05	9:44	113:22
7-12	36	1,093	750	31,120	250	11,090	3:07	106:45	0:05	9:49	116:34

* Spraying for BLM.
** 200 acres for BLM.

Average number gallons per day 1,245
Average number acres per day 444
Average spray time per day 4:27
Average ferry time per day 0:24

Average loads per day 44
Average number gallons per load 28.5
Average number gallons per acre 2.81

VII. RECOMMENDATIONS AND CONCLUSIONS

1. Helicopter spraying to control sagebrush and wyethia is adaptable to Region 1 conditions and continued use is recommended.

2. Prepare future bid contracts on a per-acre basis. Consider including flagging and the hauling of spray materials from a mother tanker to the helispots as part of bid.

3. Make early evaluation of the three test plots to see if less carrier and 2,4-D and acid equivalent can be successfully used. Should test plots prove this to be true, costs can be further reduced by an estimated 50 cents per acre.

4. Soliciting bids for flying on a per-acre basis will reduce size of Forest Service crew to nine men. This savings in manpower will reduce costs by about 60 cents per acre. Experience gained in planning and organizing will also help to reduce overall project costs.

5. It is the opinion of the writers that future cost for this type of spraying will be reduced to approximately $4 per acre.

6. Fully coordinate all tentative spray projects of this type with the local game biologist of Montana Fish & Game Department.

7. Secure needed protection agreements, tanker equipment, and complete plans for calendar year 1960 spraying by April 1, 1960.

Appendix A

BEAVERHEAD HELICOPTER SAGEBRUSH SPRAY OPERATION SAFETY PLAN

A. Refueling Helicopter at Heliports

1. Helicopter engine will be shut off.
2. Helicopter and gasoline containers will be grounded.
3. NO SMOKING within 50 feet.
4. NO SMOKING signs will be posted.
5. 15-pound fire extinguisher will be on hand.
6. Keep unauthorized personnel and spectators 100 feet away.

B. Chemical Resupply at Heliports

1. NO SMOKING signs posted.
2. NO SMOKING within 50 feet.
3. Only those personnel loading will approach helicopter, and only on signal from pilot, AND ONLY FROM THE FRONT. Others remain at least 100 feet away.

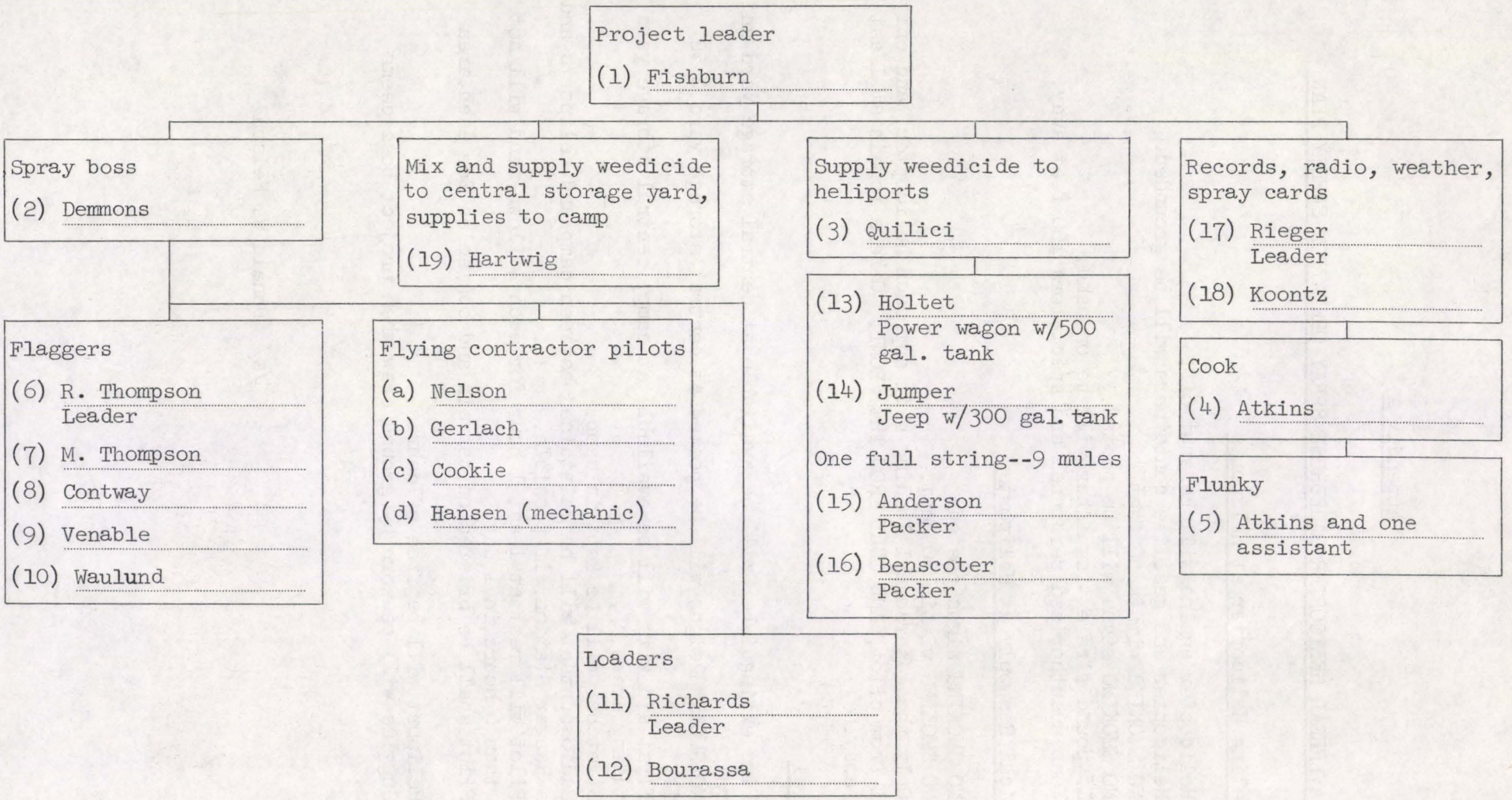
C. General

1. Fire extinguisher will be available at central storage yard and on tankers.
2. NO SMOKING signs will be posted at central storage yard - 50 feet limit.
3. First aid kits will be available at camp, central storage yard and at loading areas.
4. Stretcher will be kept in camp.
5. Radio contact will be maintained between camp and heliports and with Lima Ranger Station, if possible.
6. Pilot will rest at least 1 hour for each 4 flown, and will not fly more than 6 hours in 1 day.
7. Pilot shall be briefed on terrain and obstacles for each area flown.
8. Heliport will be free of debris.
9. Goggles will be worn by ground crew when project boss deems advisable.

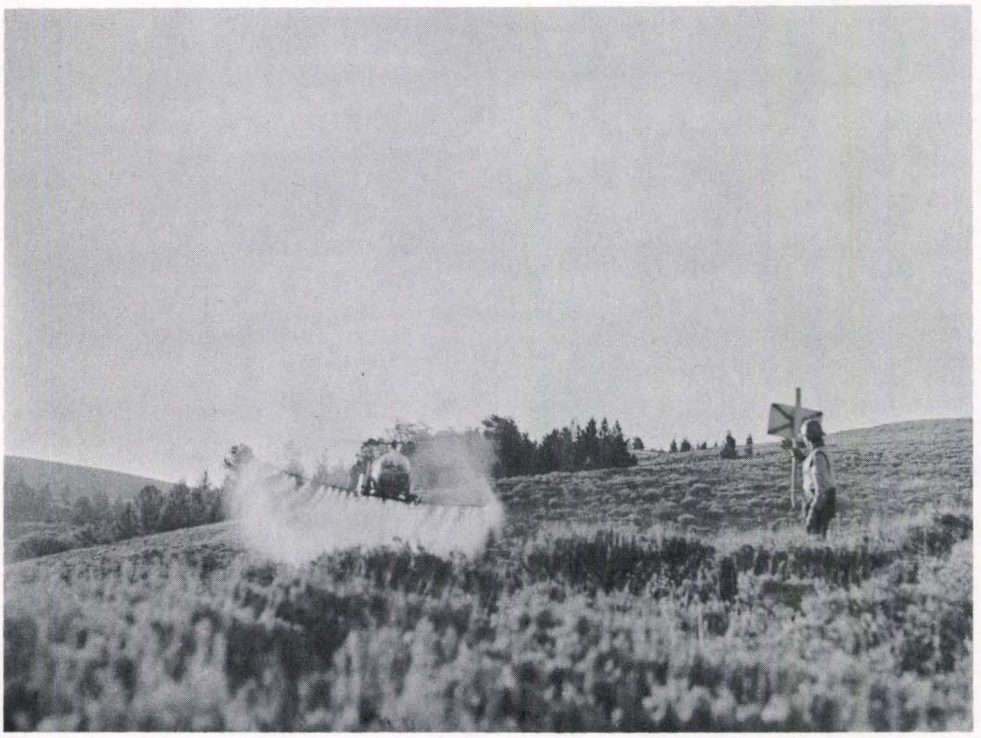
/s/ Donald W. Nelson

Appendix B

SPRAY PROJECT ORGANIZATION SHEET



The Bell G-2 helicopter and spraying equipment. Using milk can to load helicopter.



Forcing 2,4-D chemical spray into big sagebrush.